

REMARKS

The Specification is amended herein to correct grammatical errors. No new subject matter is added.

Claims 1-16 are pending in the application. Claims 1-16 are rejected. All rejections are respectfully traversed.

The invention manages traffic over a channel of a network connecting a sender end system and a receiver end system. The traffic includes multimedia packets. The channel is modeled as a queue having an associated queue occupancy. The times when packets are sent and the times when feedback messages are received are maintained in the sender end system. A time series of samples for a service time experienced by each packet sent is updated based on the total number of packets sent and the total number of feedback messages received. A queue occupancy for a next packet to be sent is then predicted based on the time series, and the next packet is sent according to the predicted queue occupancy.

Claims 1, 4, 8, 9, 12, 13, 14, 15 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Wacławsky et al. (U.S. Patent No. 5,226,041).

The invention *models a channel as a queue* having an associated queue occupancy and determines a predicted queue occupancy for the channel modeled as a queue. Wacławsky uses an actual, physical queue of an intermediate node and measures queue size information and departure rate information to predict occupancy of the physical queue in the intermediate node. Then, based on repeatedly measuring cycle times for sending and receiving a window's worth of data packets and storing

the cycle times in a table, Waclawsky determines a throughput value for the network from the cycle times, see col. 2, lines 14-57, particularly lines 53-57. A person of ordinary skill in the art would readily understand that a physical queue of an intermediate node as in Waclawsky can never anticipate a channel modeled as a queue as claimed. Further, claimed is updating time series of samples for a service time experienced by each packet sent based on the total number of packets sent and the total number of feedback messages received. Waclawsky sends a single data packet as a marker upon receiving an entire window's worth of packets. The marker of Waclawsky can never anticipate samples for a service time experienced by each packet as claimed. Therefore, the Applicants request the Examiner reconsider and withdraw the rejection based on Waclawsky.

In claim 4, each sample t_s equals a departure time of a packet n - maximum(departure time of a packet $n-1$, arrival time of the packet n). The Examiner points to col. 4, lines 40-44 as describing how to determine each sample t_s as claimed. However, as described by Waclawsky at col. 3, lines 45-52, *"Each window's worth of data which is input at the input node includes a marker. When that marker reaches the destination node at the end of the serial network, that marker is fed back to the input node. When that feedback is received by the input node, a decision is made as to whether the window size is to be changed for the next window's worth of data to be input."* The marker is a data packet that indicates a *window's worth of data* was received at the destination node. MPEP 2131 explicitly states that in order to anticipate a claim "each and every element as set forth in the claims" must be found in the prior art reference." The identical invention must be shown in as complete detail as is contained in the ... claim." Claimed is each sample t_s equals a departure time of a packet n - maximum(departure time of a packet $n-1$, arrival time of the packet n). Nothing in

Waclawsky describes subtracting from a departure time of a packet the greater of either a departure time of a previous packet or the arrival time of the packet.

Waclawsky can never anticipate what is claimed.

In claim 8, the sender end system is connected to the receiver end system via a relay, and the channel includes a link from the sender end system to the relay and a link from the relay to the receiver end system. Here, the channel modeled as a queue includes two links. As stated above, Waclawsky never teaches modeling a channel as queue. Waclawsky describes a channel having an intermediate node including an actual, physical queue. Claimed is a channel, which includes links, modeled as a queue. Waclawsky can never anticipate what is claimed.

Claim 9 recites predicting a first queue occupancy for a first link at the sender; predicting a relay buffer fullness at the sender; and predicting a second queue occupancy for a second link at the relay. The predicted queue occupancies for each link as claimed are within a channel modeled as a queue. Again, the Examiner erroneously points to sections of Waclawsky that describe measuring packets in physical queues located in nodes of the network. The invention models the channel as a queue, and therefore does not need to measure actual physical queues to determine or predict occupancies for particular queues as in Waclawsky.

Waclawsky cannot anticipate what is claimed.

In claim 12, the relay includes independently operating traffic management and content adaptation modules. First, the Applicants deny that Waclawsky describes content management. Waclawsky never even touches on the subject of content management and the Examiners reference to window size relating to content makes no sense. Second, Waclawsky describes *dependent* traffic management and content

adaptation, which both rely on the threshold. That can never anticipate independently operating traffic management and content adaptation modules, as claimed.

In claim 13, the sender and the relay form a first control loop, and the relay and the receiver form a second control loop. The Examiner's rejection misrepresents Figures 1A-M of Waclawski. No loop exists between the intermediate node and the destination node. Not a single one of the Figures shows an arrow from the destination node to the intermediate node.

In claim 14, the content adaptation module withdraws over-allocation at the relay when the sender over-allocates bandwidth. In claim 15, the sender updates a total bits allocated based on an over-allocation withdrawal at the relay. As stated above with respect to claim 12, Waclawsky never describes a content adaptation module. A person of ordinary skill in the art would readily understand that decrementing window size at a sender can never anticipate or even make obvious an independent content adaptation module, operating at a relay, not the sender, withdrawing over-allocation at the relay.

Claims 2, 6, 7, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waclawsky et al. (U.S. Patent No. 5,226,041) in view of Li et al. (U.S. Patent No. 6,741,555).

Li describes an Explicit Congestion Notification (ECN) method for wireless applications to avoid network congestion in a TCP/IP packet-switched network. Data packets are transmitted from a source node to a destination node via at least an intermediate node. The intermediate node determines if an incipient congestion

is encountered, and inserts a flag in each data packet to notify of the congestion. When the data packets with the flags are received at the destination node, the destination node sends an acknowledgement to the source node so that the source node will reduce the transmission rate. Again, the invention models a channel as a queue. Li measures a physical queue of an intermediate node. Li can never make the invention obvious.

Claim 2 recites sending the next packet immediately if the queue occupancy is less than one; otherwise sending the next packet when the feedback message is received for a current packet if the queue occupancy is one; and otherwise delaying sending the next packet until the queue occupancy is one. Li never teaches a channel modeled as a queue as claimed.

Measuring the physical queues of the intermediate nodes as described in Waclawsky and Li has nothing to do with a channel modeled as a queue as claimed. Claim 6 recites counting lost packets; inferring and updating the available queue occupancy; considering the lost packets when predicting the queue occupancy; and using the available queue occupancy to determine a speed of congestion control. All of this is accomplished using the channel modeled as a queue according to claim 1. Waclawsky and Li fail to teach any such model. The same is true for claim 7, where the available queue occupancy is used to predict packet loss and to inform an encoder, and claim 10, where each feedback message includes application feedback data and transport feedback data.

Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waclawsky et al. (U.S. Patent No. 5,226,041) in view of Srinivasan (U.S. Patent No. 5,991,812).

Srinivasan describes traffic management for multiple queues using a queue virtual time to determine which of the queues has a lowest queue virtual time. The queue having a lowest queue virtual time is selected as the next queue to send a packet. Again, Srinivasan has nothing to do with a channel modeled as a queue as claimed. Srinivasan is even less applicable to the invention than are Waclawsky and Li. Srinivasan requires that multiple physical queues are measured to determine queue occupancy.

In claim 3, the predicting uses a multi-timescale linear prediction method. Claim 5 recites subtracting a mean μ for the time series from each pair of samples to produce a zero-mean time series for the predicting. None of the teachings in Srinivasan makes obvious the predicting recited in claims 3 and 5. The invention predicts queue occupancy for an entire channel modeled as a queue. Srinivasan can never be used to make the invention obvious.

All rejections have been complied with, and applicant respectfully submits that the application is now in condition for allowance. The applicant urges the Examiner to contact the applicant's attorney at the phone and address indicated below if assistance is required to move the present application to allowance. Please charge any shortages in fees in connection with this filing to Deposit Account 50-0749.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'AJC', is written over a horizontal line.

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